Teaching Statement – Morgan Vigil-Hayes

As the child and grandchild of teachers, coaches, and engineers, I have developed an intimate relationship with the learning process. Beginning as an undergraduate student, I have been involved with teaching and mentoring activities both in formal and community educational settings for the past nine years. My experiences as a student, researcher, and teacher have culminated in a teaching philosophy that centers on three principles: purpose, resilience, and connection.

1 Purpose

"Calling is the place where your deep gladness and the world's deep hunger meet." –Frederick Buechner

Students learn best when they have a deeply integrated purpose for learning[1]. This sense of purpose comes from a passion and enjoyment of subject material and an appreciation of the deep problems and questions in the field. As a teacher, I work to expose students to the pertinent issues of computer science through problem-based learning. For example, when teaching an introductory programming course, a major oil spill had taken place as a result of an undetected leak. As a class, we discussed the need for environmental and industrial sensing software and how we might design a system that could have detected the leak in order to prevent the massive spill. I spent the next couple weeks integrating this scenario into assignments where students were responsible for writing software modules for an oil-spill detection system.

I have also found the principle of purpose to be critical in mentoring students, particularly when helping them discern the correct path for their life goals. One of my undergraduate students was seeking a summer job opportunity that would help her pursue her interest in programming, but experienced difficulty discerning between appropriate industrial and academic options. After we discussed her interests and what questions she wanted to answer (about herself and the world), she applied and was accepted into an REU program hosted by the SETI institute.

2 Resilience

"Start where you are, use what you have, do what you can." –Arthur Ashe

One of my undergraduate advisors defined computer science as the "formal study of problem-solving." I appreciate this characterization as it centers the discipline on resourcefulness, creativity, and critical thinking[2]. My goal as a teacher and mentor is to help students become resilient problem solvers. I assist students towards this end by setting rigorous expectations on student work and exposing students to non-trivial assignments. As a teaching assistant for an undergraduate computer architecture course, I designed a robotics project that required students to develop robots that could perform different tasks and could ultimately operate in a "battle game" against other robots at the end of the semester. On top of this, I had students rotate partners between modules of the project so they could experience working with different types of thinkers. I found this project to be successful because it presented students with the unfamiliar task of integrating hardware and software through machine code, it presented an open-ended problem that required critical thinking (i.e., how to design a robot that could sense and respond to the unanticipated actions of other robots), and it gave students an opportunity to analyze and develop unfamiliar software approaches. Effective development of resilience demands that scaffolding be provided to students as they encounter learning challenges. I support students through the challenges of classroom material by giving timely, constructive criticism of their work and also incentivizing responses to feedback. One of the most effective techniques I implemented for my C++ programming course was

[1] Webb, David C. et al. "Toward an Emergent Theory of Broadening Participation in Computer Science Education." Proceedings of the 43rd ACM Technical Symposium on Computer Science Education. ACM, 2012.

[2] Ames, Carole, and Jennifer Archer. "Achievement Goals in the Classroom: Students' Learning Strategies and Motivation Processes." Journal of Educational Psychology 80.3 (1988): 260.

providing students with the option to resubmit midterm exams and projects for a limited amount of extra credit. These resubmissions included a revised solution as well as an explanation of why their original response/code fell short of the rubric. I found that this gave students the opportunity to correct their thinking, take ownership of their understanding, and to move past their failures. For the students who engaged with this opportunity, I saw improved mastery of content and an increased willingness to tackle difficult programming problems.

3 Connection

"To see a World in a Grain of Sand and a Heaven in a Wild Flower ." –William Blake

I believe the most compelling computational thinking is that which is informed by connections to other disciplines. When guest lecturing in a computer networks class, I have introduced research investigating the algorithms by which ants discover the shortest path through a complex maze. Similarly, I have introduced classes to routing protocols designed to mimic the spread of an infectious virus. The more students are trained to be vigilant for these connections, the greater variety of problems they will be able to solve and the more innovative the solutions they create.

I am also an advocate for relational connections. Some of my richest learning opportunities have taken place in the context of conversations with my advisors, colleagues, and students. I consider it a privilege to be able to connect with a diverse range of people on a professional level and to that end I prioritize setting aside time to connect with students and colleagues. As a faculty member I would consider it to be a critical part of my job to help connect students to other students, faculty, and community members who could help expand and further their learning through the sharing of ideas and experiences.

4 Teaching Interests

As a result of my formal education and teaching experience, I am comfortable teaching any fundamental computer science course at the undergraduate and graduate level. Given my research background, I am particularly interested in developing advanced curricula in a wide variety of special topics within networking and mobile computing, including courses on **network characterization and measurement**, **social network analysis**, **surveys of state-of-the-art research in mobile and pervasive computing**, and **interdisciplinary perspectives on information and communication systems for challenged environments**. Additionally, I am interested in developing curricula that surveys and critiques pedagogical approaches to computational thinking.

Students and teachers co-create the learning environment. Interacting with students gives me the opportunity to share the privilege of my professional experiences and it provides me with a fresh perspective on my field. In addition to adhering to the principles of purpose, resilience, and connection, I plan to be a responsible steward of the learning environment by respecting and responding to students' diverse learning styles and backgrounds, bringing my expertise to bear on classroom materials and topics, and leveraging my training as a teacher and researcher to continually improve my teaching techniques and methodologies.